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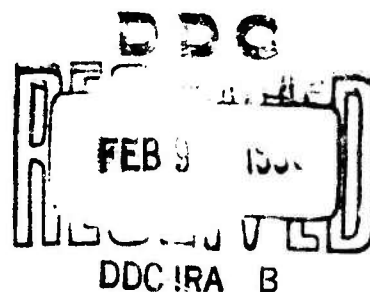
DATING HUMAN MEMORIES BY HYPNOSIS

J. W. Gebhard

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**DATING HUMAN MEMORIES
BY HYPNOSIS**

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FOREWORD

This brief excursion into one aspect of the literature of experimental hypnosis grew out of discussions on self-organizing systems held at the Laboratory during the winter of 1958-1959. In particular, the question of experimental methods for dating the ages of human memory traces was raised in several conversations with Dr. C. F. Meyer. It has long been claimed that the recovery of human memories that are not available in the normal waking state can be facilitated by the use of hypnosis. Dr. Meyer asked whether or not the claims for hypnotic improvement of memory were valid. If so, what was the precision with which an old memory could be dated by this method. These questions were sufficiently interesting to warrant an examination of the literature.

Memory in living organisms depends upon currently unknown modifications that are believed to take place in neural tissues. A fundamental problem about such neural modifications concerns their stability with time. Are all memory traces laid down in the nervous system retained indefinitely? If not, are some retained indefinitely? Or are memory traces subject, in varying degrees, to the fading effect shown in the negatively accelerated curve of forgetting found in many studies on the retention of learned material? These have long been intriguing questions. They take on new interest when raised about how to devise the storage sections of machines that may possibly learn.

The portion of the human nervous system that presumably may store memory traces contains about 15,000 million neurons. If these neurons are naively assumed to be merely singly connected at the synapses, this is adequate to provide unique storage for each of the memory traces that might be laid down during a lifetime of 70 years. There is, however, abundant histological evidence for multiple connectivity at the dendritic tree, permitting complex pathways through neuron chains. At least two modes of activity are present—excitation and inhibition. It is evident, therefore, that very large numbers quickly result for any retention mechanism that might be based on switching combinations.

The storage capacity of the largest digital computers at this writing is only somewhat over one million bits. This sets one of the limits on what a sensing, learning and remembering automaton can be expected to do. More immediately it poses the question of how the machine should be constructed. Should it be designed to reach a fixed storage capacity and retain only this? Or should it "forget" according to some function of time and use?

The spatial storage properties of the brain have received the lion's share of the attention over the years. However, the time-binding mechanism of the brain is at the very core of the memory process, and is even more of a mystery. The experimental method of hypnotic age regression manipulates the temporal aspects of the human neural storage system. As a method of dating memory traces it suffers from a serious deficiency: there is no certain way of knowing when a neural trace was actually recorded. Therefore, there is no completely satisfactory criterion for checking the results of the hypnotic dating. This situation is somewhat analogous to the radioactive carbon dating of old scraps of bone and ash. After the age of a specimen has been estimated by the C^{14} count, it would be nice to compare it with the exact age of the sample obtained from another source. However, the dates given by the methods of geology, paleontology, and anthropology are also in error. Even when one takes into account the error estimates associated with C^{14} and other methods of dating, large discrepancies often result. Unfortunately, no error estimate exists for hypnotic memory dating, and it is usually impossible to obtain a reliable estimate from past records when a person first learned a particular item of information. Nevertheless, like C^{14} dating, hypnotic dating doubtless gets within the boundaries of the time period in question. How well this is accomplished is the subject of this review.

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Dating Human Memories by Hypnosis¹

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If a normal subject is asked to search for a specific old memory, say, the day of the week on September 16, 1931, he typically gives up before half trying, for such a request seems unreasonable. In hypnosis, however, there exists a procedure for recovering old memories that utilizes high motivation and specificity in the instructions to the subject, and seeks, thereby, to increase the accuracy of the response. To achieve this it is emphatically suggested to the hypnotized subject that he is actually living on September 16, 1931, and that his age is now what it was at that time. The ability of this method to recover some old memories in a spectacular way is generally admitted, but its power for dating memories with precision is greatly debated. The claims range from those purporting recall as far back as the time of birth and the instant of conception (Hadfield, 1928; Kelsey, 1953), to those asserting no superiority whatever of hypnosis over the waking state.

The question at issue is how memories are stored in the neural tissues. If they are stored as complete systems in unaltered state, hypnotic dissociation may be a key that unlocks the files. If memories progressively change and decay with time, neither hypnosis nor anything else will reinstate what no longer exists. The purpose of this review is to assess the experimental data that have been collected on recovering remote memories by hypnosis in order to form an estimate about the age and condition of the memory material that may exist in the neural store of an adult.

Hypnotic Recovery of Memory

The reversion of the individual at one stage of development to forms of behavior normally occurring at an earlier stage of development is known as regression. This process may be characterized by the reactivation of specific old habits, or the primitivation of action, or both (R. R. Sears, 1943). Of the several ways in which regression may occur, we are concerned here only with the use of hypnosis to produce, experimentally, a controlled return to a suggested prior age. This is called hypnotic age regression, and the dramatic changes in the adult personality that often take place were reported by Krafft-Ebing (1893) in experiments on a single patient done as early as 1887. Spontaneous regressions under hypnosis, even under self-hypnosis, have also been described, and have a bearing on the controlled regressions (Dieterle & Koch, 1937; Keir, 1945; Gill, 1948; Schneck, 1955). When a subject is hypnotically carried into the future, to an age later than his current age, the result has been called by Kline age progression (Kline, 1951a). This kind of experiment was first reported by Dolin (1934) and later by others (Kline: 1951a, 1953a, 1954; Kline & Guze, 1951; Maiorov & Suslova, 1952; Israeli, 1953; Rubenstein & Newman, 1954). It is clear that the recovery of old memories can be studied only in age regression. Age progression is of interest in this review only as it applies to the question of role-playing, a possible artefact that has always made the interpretation of experiments in hypnosis difficult.

Method

In controlled age regression the subject is first deeply hypnotized and the experimenter suggests, with suitable emphasis, a chronologically earlier age. The term "deep" introduces an initial difficulty. There is some agreement that hypnosis must be sufficiently deep to produce convincing age regression (Sarbin, 1950a), but satisfactory criteria for the objective measurement of hypnotic depth are not always used. Careful experimenters make an effort to specify depth by the use of such scales as those proposed by Friedlander and Sarbin (1938), and Davis and Husband (1931).² Even with the aid of a scale, however, the depth of hypnosis is a matter of the experimenter's judgment.

During the hypnotic state the responses elicited from the subject, or emitted spontaneously by him, are observed and recorded by the experimenter. As criteria for the validity of hypnotic age regression, the least satisfactory of these have been reported by nearly all observers: infantile or childlike behavior such as weeping, thumbsucking, baby talk, feeding from a bottle, bedwetting, and the like. The most objective criterion that has been applied is the attempt to recover physiological mechanisms that differ clearly in the adult and immature individual. These mechanisms are reflexes, the electroencephalogram (EEG), and the heart rate. Next in objective rigor are psychological measures capable of being scaled, such as intelligence and drawing tests. Finally, use has been made of projection tests like the Rorschach that measure broad aspects of the personality.

A Basic Problem

In considering the validity of the recovery of old memories by hypnosis, three kinds of possible behavior must be examined. Of greatest interest for the present purpose is the possibility that the subject may be responding exclusively on the basis of neural mechanisms that were established in the nervous system prior to the cut-off date suggested by the experimenter. Of little interest is the second possibility that he may be using memories of any age to act out a role based on his interpretation of the problem posed to him by the experimenter. Finally, his responses may be a combination of both of these in varying amounts. It has been very difficult to produce unobjectionable evidence for the first behavior.

Erickson and Kubie noted the first two aspects of this problem, and in a laudable effort to distinguish them introduced the term revivification to designate the process of reliving, under hypnosis, "....the patterns of behavior of the suggested earlier period of life in terms only of what actually belonged there. It is not a 'regression' through the use of current memories, recollections or reconstructions of a bygone day. The present itself and all subsequent life and experience are as though they were blotted out" (Erickson & Kubie, 1941). By regression, Erickson and Kubie meant the recall and acting out of past events, with current memories being available.

Weitzenhofer (1953, 1957), in deploring the indiscriminate use of the term "regression" to cover all kinds of observations, pointed out the third, or mixed, aspect of the problem. He proposed the term regression type I for the role playing kind of

response, regression type II for a true return to a past psychophysiological state, and regression type III for the mixed condition. The term revivification was retained for "the process by means of which such a psychophysical shift is brought about in association with a temporary ablation of certain 'future' events" (Weitzenhofer, 1953). In Weitzenhofer's opinion the literature prior to 1953 contained no reports of type II. All instances were of the mixed type III.

In the following sections, Weitzenhofer's classification will be applied wherever possible. While the emphasis will be on the work using objective criteria, some reports of clinical observations will also be included.

Physiological Studies on Old Neural Mechanisms

The physiological alterations producible by hypnosis have been recently reviewed, and the validity of many of them are now well established (Crasilneck & Hall, 1959). Our concern here, however, is with the use of physiological criteria for testing the validity of age regression.

Electroencephalogram. Kupper (1945) was the first to report distinguishing between normal and abnormal EEGs existing in the same subject's life at different times by hypnotic age regression. A 24 year old patient under study for convulsive seizures was found to have an abnormal EEG in the waking state that had existed since age 18. Regressed to age 12, the EEG was found normal. Serial EEGs remained normal in intervening years of regression, becoming abnormal abruptly in the 18th year. The change-over point was found to coincide with an episode at age 18 involving great anxiety.

The seizure could be activated hypnotically by recalling the emotionally critical parts of this episode.

Schwarz, Bickford, and Rasmussen (1955) verified the possibility of reactivating seizures by hypnosis. They used 10 patients suffering from convulsive disorders without known organic cause. Two patients had moderate dysrhythmias in the EEG, the others had either minimal dysrhythmias or were normal. In no case, however, was the induced seizure accompanied by a change in the EEG. The possibility of direct comparison with Kupper was lost since none of the patients with abnormal EEGs was regressed to an age prior to the first onset of seizure. Another study was done on 16 patients whose seizures had probable organic cause. Eleven of these cases showed "moderate" to "marked" dysrhythmias in the EEG. In no member of the organic group was it possible to initiate seizures by hypnotic suggestion. It is reported that "in many cases regression was carried to the time of the patient's first or last seizure...." without change in the EEG. Unfortunately, again, there is no indication of what might have happened to the EEG had regression been carried to an age earlier than that of the first seizure.

Ford and Yeager (1948), however, reported on a 25 year old patient with a history of grand mal seizures dating from a head injury at 16 months. One year before a craniotomy, his EEG consisted of slow 4-6 cps waves with occasional random spikes in the right frontal area. After "a resection of a porencephalic cyst of the right frontal lobe" some seizures still occurred, but the EEGs were normal on two occasions and abnormal on two others. A year later he was regressed to the year before the operation when his

EEG consisted of slow waves and a few spikes. The EEGs now showed "mild cerebral dysrhythmia with no focalization and were essentially the same as those taken during the waking state".

Schwarz, et al. (1955) further reported that one subject showed an altered EEG when regressed to age three. A frequency analysis of the EEG pattern showed a shift from normal alpha predominance to the delta and theta frequency bands. This result, however, was neither constant nor reproducible. Five other subjects when in "deep regression" showed no notable EEG change although infantile behavior was grossly manifest. True and Stephenson (1951) studied six subjects regressed to as young as one month, and found no changes in the adult EEG. Finally, McCranie, Crasilneck, and Teter (1955) similarly regressed 10 subjects to one month with no effect on the adult EEG.

Tables 1 and 2 summarize the results of the investigations to date. The conclusion to be reached from Table 1 on convulsive patients is that Schwarz et al. (1955), who had an adequate number of cases, stopped their work too soon. The situation is better in Table 2 where it appears clear that the neural processes underlying the immature EEG cannot be reconstituted in normal adults by hypnotic age regression.

Unconditioned Reflex. As early as 1928 Gakkebush alluded to work that he and Polinkovskii had already completed on simple unconditioned motor reflexes observed under hypnotic age regression (Gakkebush, 1928; Gackebouch, 1930). When the complete account appeared, this was restricted to the sucking reflex reported in detail on one case, a male of 34 years, although other subjects

Table 1

The Effect of Hypnotic Age Regression on the EEG
of Patients with Convulsive Disorders

Investigator	No. of Cases	Diagnosis	Waking EEG	EEG when hypnotically regressed	
				To time of first seizure	To time before first seizure
Kupper (1945)	1	Not organic	Abnormal	Abnormal	Normal
Schwarz et al. (1955)	10	Not organic	Abnormal except for 2 cases	Unchanged	Not done
Schwarz et al. (1955)	16	Organic	Abnormal	Unchanged	Not done
Ford & Yeager (1948)	1	Organic	Abnormal	Abnormal	Abnormal

Table 2

The Effect of Hypnotic Age Regression on the EEG
of Normal Adult Subjects

Investigator	No. of Cases	Waking EEG	Age to which regressed	Regressed EEG
Schwarz et al. (1955)	1	Adult	3 yrs.	Infant, but not constant
Schwarz et al. (1955)	5	Assumed adult	Not stated	Unchanged
True & Stephenson (1951)	6	Adult	1 mo.	Adult
McCranie et al. (1955)	10	Adult	1 mo	Adult

were tested (Gakkebush, Polinkovskii and Fundiller, 1930³). During a session of 55 min. on one day the hypnotized subject was told he was just born and a nipple was placed in his mouth. He sucked weakly. When told he was wet and cold there was no reaction. It was suggested during succeeding tests that he was 2 weeks, 1, 2, 4, 5, 6, and 9 months old. The sucking response became energetic and greedy. Interposed tests up to nine months involving higher levels of response such as, "Mama is not at home" and "What is your name?" produced no reaction. At nine months, "Mama" was successfully repeated, and crying was elicited when told that he was alone and afraid. A week later the ages of 9, 11, 12, 13, and 14 months were suggested during a half hour session. Sucking was present at 11 months, fell off at one year, and disappeared between 12 and 13 months.

Dr. N. D. C. Lewis produced a dorsiflexor response to plantar stimulation by hypnotic age regression in about 1926 (Gidro-Frank & Bowersbuch, 1948). This led to the much-quoted study of Gidro-Frank and Bowersbuch (1948) who reproduced this phenomenon in three subjects, one aged 42, and two aged 21. While the general infantile behavior of the subjects differed somewhat, all three gave normal plantar flexion responses down to a regressed age of six months. At about five months and below, however, the normal reaction changed to dorsiflexion of the great toe with fanning of the outer toes.

This startling observation was first confirmed by True and Stephenson (1951) who examined five subjects giving plantar flexion during the waking state, and one subject who gave an equivocal Babinski sign. All except the equivocal case showed dorsiflexion of the great toe when regressed to one month by hypnosis. Since the

positive Babinski sign sometimes occurs during sleep, care was taken to assure that the subjects had not gone to sleep during the experiment. The writers further noted that two of their six subjects exhibited the sucking reflex at one month, and that a third showed the Moro reflex to the sound of an inadvertant cough.

McCranie et al. (1955) also reported sucking responses at five months and below. In tests of the plantar reflex at this regressed age, three of their 10 subjects gave the Babinski toe response. This returned to normal plantar flexion when they recovered their usual chronological ages.

Finally, several brief confirming observations have been given without details on the production of infantile reflexive behavior (LeCron, 1952a; Weitzenhofer, 1953; Sarbin, 1956). LeCron states that he "...confirmed this (dorsiflexion) finding with several subjects". At the same time, it was determined that the sucking reflex was present in these subjects when regressed to infancy. Sarbin noted in a footnote to a discussion of this problem that he had seen the positive Babinski only once. The response appeared spontaneously in a subject in deep hypnosis. Weitzenhofer's comment was also in a footnote.

Conditioned Reflex. Gakkebush et al. (1930) studied the development of a conditioned reflex under age regression. At the suggested age of nine months the subject was shown a burning match. He grasped the flame and was burned. On tests at 10, 15, and 18 minutes later the same response occurred. On the fifth trial the flame was refused, and was called "ziza", baby talk for "spichka" (match). The match was again avoided on the sixth trial three minutes later. Two minutes after this the age of 12 months was

suggested, and the match was approached, but not grasped. This resulted in a slight burn. Five minutes later the match was again refused. Conditioning to a pain stimulus was held to have occurred on the fourth trial. It is unfortunate for the questions asked in this review that the experimenters did not then suggest an earlier age, say, six months, and repeat the test.

More germane to the problem is the effect of regression on acquired responses shown in the work of LeCron (1952a, 1952b) and McCranie and Crasilneck (1955). In both studies the unconditioned responses used were hand withdrawal to an electric shock, and eye lid closure to a mechanical stimulus. LeCron tested two subjects each on the hand jerk and eye wink, and found that the conditioned responses to a conditioned auditory (buzzer) stimulus disappeared when the subject was regressed hypnotically to an earlier age.

McCranie and Crasilneck used six subjects in each experiment. They found that while the hand withdrawal conditioned to an auditory stimulus disappeared under regression, the eyelid reflex conditioned to a tap on the wrist was retained at any age level. McCranie and Crasilneck did not directly account for the discrepancy between their results and those of LeCron. They distinguished between conditioned responses of voluntary and involuntary movements, and held the involuntary to be unaffected by age regression, whereas the voluntary can be influenced by psychological processes. In suggesting that their subjects "somehow 'knew' what was expected of them under hypnotic age regression and, in the case of a voluntary movement, were able to comply with that expectation", they imply that this may have been true of LeCron's subjects. This does not explain, however, how LeCron's subjects were able to lose the involuntary response as well as the voluntary one.

The development of conditioned motor associations was followed under hypnosis from one month of age to two years, four months (Gakkebush et al., 1930). Starting with no reactions, grasping, holding up the head, sitting, standing, and walking were observed to develop along a pattern that progressed with suggested age. "We saw how the 'infant' progressed from mass, diffused, uncoordinated motions to the precise, strictly differentiated functioning of separate muscular groups."

Other Physiological Effects. Many years ago Erickson (1937) reported a case wherein a 19 year old patient, regressed to age 17, lost consciousness when reliving under hypnosis a homicidal assault suffered at that time. This kind of phenomenon has also been observed by Weitzenhofer (1953).

Ford and Yeager (1948) cited a case in which a right homonymous hemianopsia existed in a patient prior to an operation to remove a colloid cyst from the floor of the third ventricle. After the craniotomy, vision returned to normal. When the subject was regressed to a time before the operation, however, the hemianopsia was found to return.

LeCron (1952b) reported the unpublished experiment of W. H. Roberts and D. Black on a single case of a refractive defect existing in a subject since childhood. Glasses were first fitted at age 12. The results of an examination of vision during the waking state and during hypnotic regression to age 7 showed "....a small but measurable improvement of both near and far vision...." when under hypnosis. Direct suggestions for improvement under unregressed hypnosis gave no improvement.

Another unpublished study reported by LeCron (1952b) is due to J. G. Watkins and B. J. Showalter. The eye movements of a 19 year old subject were photographed during reading at the regressed age of six years, 10 months. The ophthalmographic record at this age showed the poor ocular coordination and stability typical of a first grader.

True and Stephenson (1951) attempted to recover the higher pulse rate of infancy by regression. In four of six subjects the pulse rate rose with the induction of hypnosis, in one case markedly so although the return to the pre-induction level was rapid. With regression to eight years, six years, and one month, there appeared to be a slight elevation in pulse rate over the pre-induction level, but the authors reported great variability and drew no conclusions from their limited sample. Only in one case was there a clear-cut increase.

Psychological Studies on Old Neural Mechanisms

Recovery of Recently Learned Material. The first problem considered is the recall of newly acquired material under hypnosis without explicit instructions for regression. Regression appears to be implicit, however, in that the subject is required to reproduce material that was learned earlier, even though earlier means in the immediate past. It should be made clear that we are concerned here only with the problem of learning the material in the normal waking state with recall under hypnosis, and not the reverse.⁴

Young (1925,1926) found in a sizeable experiment that hypnosis improved the ability to recall early memories⁵, but had no effect on those recently acquired. His material for the latter consisted of nonsense syllables, word pairs, lists of words in

logical order, and objects normally displayed in a room. However, I must agree with Weitzenhofer (1955) that it is not clear that the original learning was accomplished in the waking state, and that the comparison was made between waking and hypnotic recall for material so learned. Nevertheless, I assume, like Weitzenhofer, that this was the case. While Young based his conclusion on the variability of his subjects, there is a suggestion in his data that whereas his average hypnotized subjects performed no better than the control group, the more deeply hypnotized somnambulistic subjects recalled more than the controls.

Huse (1930) used only nonsense syllables. From results obtained on eight subjects, and a 24 hour delay between learning and recall, she concluded that there was no hypermnesia under hypnosis.

Similar material in the form of lists of three-place numbers was used by Mitchell (1932) to examine the effect of the trance state on recall. Two subjects were used with a delay between the learning and relearning conditions of only a few minutes. The results measured by savings in trials, savings in errors, and recall, again showed no improvement under hypnosis as compared with the waking state.

Stalnaker and Riddle (1932) studied the same problem, but tested for the memory of meaningful material, such as poetry. Another difference was that the material had been memorized a year or more prior to the experiment. Twelve subjects were examined on the same material in the waking and hypnotic conditions. The results now showed about 54 percent more recall under hypnosis, giving clear evidence for hypermnesia.

White, Fox, and Harris (1940) introduced their experimental work with an analysis of the earlier studies in which they pointed

out that while hypnotic hypermnesia had been shown to occur for remote, but not recent learning, it was also true that it occurred for meaningful rather than nonsense material. They chose, therefore, paired nonsense syllables like those of Huse, and poetry like that of Stalnaker and Riddle. To this they added short motion picture sequences to test the effect of non-verbal material more like the kind often reported in the clinical literature. Eight subjects were used for the carefully memorized material, serving both as control and experimental groups. For the casually learned material in the films, five new experimental subjects, and four controls were used. Tests for the memorized material were conducted 24 hours after learning; the film material was tested from one to five days after viewing.

The results showed that different kinds of material produced different amounts of recall under hypnosis. When compared to normal recall, the gain due to hypnosis was -15.7 percent for nonsense syllables, 53.1 percent for poetry, and 83.1 percent for the scenes. The results for nonsense pairs agree with Young and Huse, and those for poetry agree with the finding of Stalnaker and Riddle. The scenic material, tested here for the first time, responded best of all to recall under hypnosis.

Rosenthal (1944) suspected that hypnotic hypermnesia might better exist for emotionally charged material. Emotional content could much more readily reside in meaningful material than in nonsense lists. Using 13 subjects, Rosenthal tested this hypothesis in a series of well-controlled experiments with nonsense syllables, poetry, and profane and obscene words. Emotional tension was introduced by success-failure instructions, emphasizing special

importance to the subjects of obtaining good recall scores. The results showed that hypermnesia was possible even with nonsense syllables when the items were emotionally stressed. The findings for unstressed nonsense material and poetry agreed with the work of others.

The 24 subjects of A. B. Sears (1954) were asked to remember miscellaneous objects arranged on a table. The experimental design was selected to test only the hypothesis that hypnosis would have no effect on either immediate or delayed recall. For the experiment as a whole there was consistently better recall under hypnosis than in the waking state. While Sears properly did not make a quantitative statement of the improvement he found, if one is permitted to attempt a few estimates from his data, it may be as much as 25 percent in some comparisons.

Finally, there are the memory experiments of Eysenck (1939-41) based mainly on one subject. Here I again agree with Weitzenhofer (1955) that the procedure followed is unclear. I incline to the view, however, that all of Eysenck's tests were made either in the waking state or in the hypnotic state, and that he did not compare hypnotic and waking recall for material learned originally in the waking condition. For example, it would be difficult, but perhaps not impossible, to measure immediate memory span by presenting the digit series in the waking state, and testing for recall in the hypnotized state. His finding that there was no improvement under hypnosis for tests of memory, therefore, should not weigh greatly in this review.

Mental Age in Regression Measured by Intelligence Tests. An air of excitement clung for a time about the possibility of objectively measuring the mental age (M.A.) of a subject regressed hypnotically to a suggested chronological age (C.A.) by standard intelligence tests. Russian investigators first reported success in doing this. Gakkebush et al. (1930) and Platonov and Prikhodivny (1930) used the Binet-Simon test method to assess the M.A.s of subjects regressed to various age levels. Three years later the results of the second investigators were again reported in English translation (Platonow, 1933).

The one subject of Gakkebush et al. was carefully tested at suggested C.A.s from three through 11 years. Mental ages were found from five to 11 years as shown in Table 3 where it is noted that from the age of eight the subject's M.A. began to lead his actual age⁶. Data from the Rorschach and an interview provide some insight into personality disturbances that may account for this.

In Platonow's study (1933) the M.A.s obtained for two cases showed a rough correspondence with the suggested C.A.s of 4, 6, and 10 years, although they tended to be somewhat higher. The third subject produced M.A.s that were markedly higher at all regressed ages. Platonow diagnosed him as of "premature development", supporting this by the comment that he was then "one of the brightest students of a technical school". In no case, however, was evidence presented on the measured I.Q.s of these subjects at any age in the waking state. The closest to this was an attempt to have the subjects act out the taking of test items at

Table 3

Binet-Simon Mental Ages at Different Chronological Ages
Suggested under Hypnosis. The Subject's Actual Age was 34
After Gakkebush et al. (1930)

C.A.	3	4	5	6	7	8	9	10	11
M.A.	-	-	4.7	5.8	7.2	9.8	12.2	13.3	14.3

regressed ages in the waking state. In this they were said to have failed.

Young (1937, 1940) proceeded shortly to examine the Russian work. He used 14 experimental subjects, and seven controls who could not be hypnotized. These subjects in the waking state had I.Q.s ranging from 96 to 110. Items from the Stanford (1916) tests given to a group of 10 subjects regressed to age three gave an average M.A. of about four years, eight months. Individual tests on nine subjects, five of them the same, gave an average M.A. of about five years, 11 months. The seven control subjects simulated three year old behavior to achieve an average M.A. of five years, five months. Young's subjects, therefore, showed the same tendency toward M.A.s higher than the regressed C.A.s as had Platonow's. He suggested that performance on intelligence tests under hypnosis was role-playing, and in his review of the literature held the view that, to date, there was "....no report of a rigorously done research favorable to age regression" (Young, 1941).

Several points of rigor in Young's experiments have been questioned. Dorcus, Brintnall and Case (1941) criticized his preliminary report for inadequate controls and claimed that "almost any conclusion could be derived from this investigation". It is not apparent from Young's abstract of the paper given before the American Psychological Association in 1937 that he drew any conclusion. He merely asked this question when his subjects failed to reach earlier than the six year level when regressed to three years: "Can this mean that the personality as the adult

subject experiences it in himself takes form around six years of age?" (Young, 1937). More cogent points about Young's (1940) complete paper were raised by Sarbin. First, "....no objective data were available against which to check the validity of the responses on the Stanford-Binet test items", and second, "....no systematic attempt was made to consider the effect of variations in the depth of hypnosis" (Sarbin, 1950a). To correct this, Sarbin found 12 subjects on whom M.A.s had been obtained at C.A.s of eight or nine and used an index of hypnotizability based on the Friedlander-Sarbin scale (Friedlander & Sarbin, 1938). M.A.s were obtained under both hypnotic and simulated regression to the ages of eight or nine. The data are shown in Table 4. In agreement with Young, the M.A. under hypnotic regression was higher than it should have been had the subject really gone back to the suggested C.A. From this Sarbin concluded that, "There is no authentic and complete regression to earlier age-roles insofar as intelligence tests are concerned". However, the data also showed that the regression index correlated with the hypnotizability scale giving $\rho = .76$ for nine subjects, and $\rho = .91$ if the three non-hypnotizable subjects were included. Against Young's finding that his non-hypnotizable subjects simulated regressed ages as accurately as his hypnotized subjects, Sarbin's data showed much poorer results under instructions to simulate.

On the other hand, positive findings relating hypnotically regressed performance to maturational power appropriate to the suggested C.A. were reported by Kline (1950). Ten subjects were used, the depth of hypnosis was not scaled, and the Otis, rather

Table 4

Stanford-Binet Mental Ages on Original Test
and under Hypnotic and Simulated Regression
After Sarbin (1950a)

Subject	M.A. on Original Test		M.A. under Hypnosis		M.A. under Simulated Regression		Regression ^a Index	Hypnotizability ^b Scale
	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.		
Rc	10	5	12	0	16	9	46	25
Ra	9	2	13	2	16	3	33	23
Ru	10	8	14	3	16	7	21	21
Gr	11	9	15	0	17	2	19	20
Hi	11	11	16	6	17	9	10	24
Ho	14	3	17	2	18	9	10	21
Ea	9	4	15	10	16	5	6	10
De	10	5	15	0	15	2	3	9
Lo	10	0	12	7	12	8	1	17
Br	10	3			14	2	(0)	0
Sa	11	9			18	5	(0)	0
Fi	10	5			19	0	(0)	0

^aThe regression index is taken as $\frac{\text{M.A. simulated regression}}{\text{M.A. original test}}$

$\frac{\text{M.A. hypnotic regression}}{\text{M.A. original test}} \times 100$

^bFriedlander-Sarbin (1938). Zero means not hypnotizable.

than the Stanford-Binet test, was given. Different forms of the test were used in the waking state, and at the ages suggested under hypnosis of 8, 10, and 15 years. Since raw scores changed with regression while the I.Q. remained constant, Kline concluded that there was a loss in achievement power consistent with maturational level, but no loss in innate brightness.

Over the years there have been many scattered studies based on single cases, and open to the criticisms of Young (1940), Sarbin (1950a), and Dorcus et al. (1941). Some of these are interesting. Keir (1945) reported a case of a 17 year old hysterical woman hospitalized because of sleepwalking during which stereotyped behavior patterns occurred. Under hypnosis she spontaneously became a schoolgirl of 13 years at a specific date in the past. In the adult state she had an M.A. of 16 years, five months, or an I.Q. of 109. At the regressed age of 13 her M.A. was 14 years, six months. The I.Q. calculated for a C.A. of 13 years gave an I.Q. of 106, very close to her normal I.Q.

Kline (1951a, 1951b, 1955) has reported the results obtained by the Wechsler-Bellevue Intelligence Scale Form I given to a 22 year old woman regressed to age eight. While the I.Q.s computed from the Verbal, Performance and Full Scale weighted scores were seven to nine points higher under regression than in the normal state, they were probably within the limits of experimental error. Kline concluded, therefore, that his results were favorable to the validity of age regression.

Spiegel, Shor, and Fishman (1945) were concerned primarily with what they call an hypnotic technique for "blocking out or

ablation of all personality developments from the present back to the specified birthday, thus releasing authentic personality-intelligence manifestations of the appropriate age level". This is simply age regression, and the evidence they offered for the success of this was Binet test data on one case of an hysterically ill patient of 23 years. Successive tests traced the increase of the M.A. from one year, six months to 20 years for 12 regressed ages. There was, nevertheless, considerable variation in the I.Q. which ranged from 95 to 134. The waking I.Q. was 123. The discrepancies at certain age levels were accounted for by the test itself, and certain factors of clinical interest in the developmental history of the subject. An attempt to have the subject simulate earlier age levels was unsuccessful. The authors held for the authenticity of behavior under regression, and promised more complete details, but no further report has appeared.

Leeds (1949) required a normal subject of 40 years to define words taken from the Stanford-Binet. The development of the ability to define more difficult words was followed from the regressed ages of two to 12 years with the conclusion that the maturation of the intellect was followed.

Rorschach Studies. Considerable effort has been made to assess personality changes occurring during hypnotic age regression by projective test techniques. First of all are the Rorschach studies ranging from reports on single cases, some hospitalized for personality disorders, to experiments using several normal subjects. While the Rorschach test has the presumed advantage of being difficult of willful manipulation on the part of the testee, it is not

well suited for providing quantitative estimates of the age of the memory material on which the responses are based. It does, however, give useful information about the personality structure at different regressed age levels that may be related to clinical or quasi-normative data.

The first study employing the Rorschach was that of Gakkebush et al. (1930) on the 34 year old subject referred to above. Starting with a suggested age of nine, personality development was traced through the 20th year. The results, when compared with what was known of the subject's background from other sources, was considered to reflect adequately appropriate changes at crucial age levels.

Bergman, Graham, and Leavitt (1947) regressed a 20 year old soldier suffering from conversion hysteria to eight alternate years starting at age three. In administering the Rorschach test it was stated that "rigorous experimental standards were not used". Nevertheless, repeated testing at several age levels was reported to give consistent results. When the Rorschach responses were compared with case history and clinical findings on the patient, the authors concluded that the "Rorschach findings....at the various regressed age levels....followed closely the clinical data".

A case of a 26 year old alcoholic was reported by Mercer and Gibson (1950) in which the Rorschach was given at the regressed ages of 6, 10, and 14 years. The results were judged to reflect changes in personality consistent with what would normally have been produced on the test at the regressed levels.

Sarbin and Farberow (1952) have taken the theoretical position that hypnosis may be regarded "as a form of a more general

kind of social psychological activity known as role-taking". This is an extension of a point of view expressed elsewhere (Sarbin: 1939, 1943, 1950b). As applied to hypnotic age regression, the subject is held to enact an age role that depends upon his current concept of his role as an adult, and that of his role as a child of a given age. These must be congruent. This interpretation was examined by the Rorschach records from two adults at the regressed ages of 3, 6, and 13 years. Data from one subject included age 18, and this subject also simulated in the waking state performance at age six. The authors concluded that success in role enactment at regressed age levels was consistent with the adult personality structure of the subject.

Norgarb's (1952) single case was that of a normal personality in a 20 year old man. The Rorschach was given in the waking 20 year old state, at 20 years under hypnosis after total amnesia for the previous test was suggested, and at the hypnotically regressed ages of 5, 8, 11, 14, and 17 years. The complete protocols and scoring are given in the paper. The records were interpreted clinically and normatively, and the conclusion was reached that the subject's development during 15 years was adequately traced by the test. In Keir's (1945) case of hysteria, on the other hand, a Rorschach reader unfamiliar with the history of the patient, found the personality unchanged by hypnotic regression to an earlier age.

The most extensive study with the Rorschach is that of Orne (1951) who used 10 subjects from 17 to 26 years of age. These were regressed to age six, and the test was given in both the waking and hypnotic states. Orne found incomplete evidence of true or complete regression, and concluded that the personality of his

subjects remained adult even at the suggested age of six.

Thematic Apperception Test. In several papers, Kline has studied the usefulness of hypnosis for investigating the origin of occupational interests (Kline & Schneck, 1950; Kline, 1953b). Most recently, Kline and Haggerty (1953) showed four cards from the TAT to a 29 year old subject in both the hypnotic and waking states. Hypnotic regression was to the ages of 7, 10, 13, and 19. These conditions were alternated with waking simulation of the same ages. The interesting protocols are given complete, and the language used by the subject was analyzed by word count and the percent usage of the parts of speech. Waking simulation revealed predominately adult behavior in which the total response to adult pictures was higher than the response to the pictures more suitable for children. Also, the percentages of word usage did not change with simulated regression. Hypnotic regression, on the other hand, showed both higher verbal productivity on the lower age level cards than on adult cards, and a progressive change in word usage with increasing regressed age. Kline and Haggerty found confirmation in these findings of the "neuropsychological validity of hypnotic age regression".

Drawing Tests. Gakkebush (1928) analyzed drawings made under hypnotic regression and found them to correspond in detail with samples obtained from the subjects' relatives. Dolin (1934), however, was less convinced by the childlike productions he found in drawing and clay modeling.

Bergman et al. (1947) included in their paper reproductions of nine Goodenough (1926) drawings obtained from their subject:

one each at eight regressed ages, and one at age 20 in the waking state. Since the instructions for giving the test were not followed, the productions contained many heads and busts. Therefore, it is impossible to score the drawings for age except very roughly. At higher suggested C.A.s they appear to reflect an increase in M.A. to an extent, and the authors interpreted them clinically as substantiating the Rorschach records and the subject's developmental history. It is curious to note that Leeds (1949) also obtained incomplete drawings showing largely the upper part of the body. Leeds' subject claimed that drawing tended to destroy the relaxed state of the trance, and he stopped working on the pictures before he came out of it.

Mercer and Gibson's alcoholic patient at a regressed age of six had an M.A. of five years, three months; at 10, the M.A. was 10 years, six months; at 14, the M.A. was 12 years, six months (Mercer & Gibson, 1950).

Another study conducted on one subject is that of Kline and Guze (1951) who used the 23 year old woman reported upon in other work on regression (Kline: 1951a, 1952). The H-T-P task, which is to draw a house, a tree, and a person, was given in a) the normal waking state, b) the waking state simulating age six, c) the hypnotic state simulating age six, d) and the hypnotic state with regression to age six. The resulting pictures were analyzed clinically and were reported to "reflect changes in the neuropsychological organization of the individual with particular emphasis upon the perceptual and learning mechanisms". The drawings are reproduced in the report. The first three are much the same to an unpracticed eye, but the pictures drawn at the hypnotically regressed

age of six are obviously more primitive and childlike.

Taylor (1950), Orne (1951), and Crasilneck and Michael (1957) conducted more extensive studies using normal subjects. Taylor's 12 subjects produced Goodenough drawings at the suggested ages of 6, 8, and 10 years, both under hypnosis and in the waking state. His attempt to distinguish clearly between "true" and "simulated" regression resulted in the following conclusions. a) The total group showed "no significant difference between the hypnotic and waking drawings"; b) the group that could be deeply hypnotized by the criteria of the Davis and Husband (1931) scale "showed a greater average deviation of the three drawing I.Q.s in the waking than in the hypnotic drawings"; c) the lightly hypnotized group showed the reverse; and d) deeply hypnotized subjects showed more primitive motor coordination and features in their drawings than did the lightly hypnotized subjects. Since primitive and mature features appeared concurrently, Taylor felt that he had no evidence for a simple return to prior memories. An examination of Taylor's data reveals that the I.Q. tended to fall with increasing suggested age as shown in Table 5A. For the hypnotically regressed condition the change was more marked than for the waking simulation. This could be due to the failure of the test with increasing age level, but as shown in Part B of the table, the correlations between the M.A.s of the drawing test and the M.A.s of the Stanford-Binet do not indicate this. It is more likely, therefore, that regression, hypnotic or waking simulation, failed to reach the suggested C.A.

Orne (1951) reached a similar conclusion in his study of 10 subjects regressed to age six. He found that drawings gave no

Table 5

Goodenough I.Q.s at Different Regressed Ages
After Taylor (1950)

Part A		Regressed age						
No. of cases		Under hypnosis			Waking simulation			
		6	8	10	6	8	10	
12		132	124	112	128	127	119	
Part B								
Correlation of drawing M.A.s with Stanford-Binet M.A.s (Goodenough, 1926).		At age 6		At age 8		At age 10		
		.832		.557		.849		

evidence of true or complete regression, and that the personality of the subject remained adult under suggestion.

A different type of drawing performance was used by Crasilneck and Michael (1957). In the Bender Visual Motor Gestalt Test, geometric designs consisting of simple figures are copied (Bender, 1938). This test was given to 10 student nurses of from 19 to 22 years of age. Four conditions were investigated: a) awake; b) awake with instructions to pretend to be four years old; c) hypnotized with instructions to pretend to be four years old; and d) hypnotized and age regressed to four years. Three raters, unaware of the nature of the experiment, rated the maturity level of the Bender drawings in half-year steps from 3.5 years to 11.5 years. Rating reliability was high. The mean motivational age levels for the four conditions were: a) 11.2 years (awake); b) 9.9 years (awake-pretend); c) 7.8 years (hypnotized-pretend); and d) 7.3 years (hypnotized-regressed). These differences, except for the comparison of c) and d), were statistically significantly different, and all were significantly different from a hypothetical mean of age four. The raters also ranked each of the four productions of the 10 subjects. The mean ranks from a) to d) were 1.1, 2.0, 3.3, and 3.6. All differences were statistically significant except that of c) and d). The judges' clinical opinions are interesting. They said that some subjects were adults, some were children, some were psychotic, and some were cases of organic damage. In any event, the performance under either hypnotic state was not typical of what is normally found in the 7.3-7.8 year age range for children. Orne also obtained an independent evaluation of his subjects' drawings from Dr. Karen Machover whose opinion is

worth quoting again. "The drawings definately do not resemble those of six-year-olds. Mature and immature features are intermingled and in certain respects the drawings in regression are more mature than those done in the waking state. The term 'sophisticated oversimplification' seems appropriate for these drawings". (Orne, 1951).

Handwriting. Like drawing, handwriting is a performance that develops progressively over the years. Krafft-Ebing (1893) first noted the changes in handwriting in a woman at hypnotically regressed ages from five to 20 years. Gakkebush similarly reported that handwriting samples showed childish characteristics under age regression, and claimed that old specimens obtained from parents were "completely identical" with productions under hypnosis (Gakkebush, 1928; Gackebouch, 1930). Dolin's paper of the same period also showed several samples of childish penmanship under regression, but Dolin felt that leakage from other memory systems contaminated the reproductions (Dolin, 1934). Suslova (1952b) obtained specimens from three subjects and found that the early samples took longer to write than the later ones; also, the copy-book style of the schoolchild was seen to degenerate at the later regressed ages into the illegible hand of the adult. Orne (1951), on the other hand, examined the handwriting of his subjects under hypnotic regression and was impressed by the adult characteristics present.

Other Psychological Studies. The best single source of miscellaneous studies on hypnotic age regression is LeCron (1952b). It is especially interesting because it contains a number of personal

communications from other workers, several of which have been mentioned above, as well as LeCron's own observations that are not published elsewhere.

An experiment by True (1949) is most remarkable. First, for the large number of subjects — fifty. Second, for the simplicity of the measure employed, which was simply the request for the day of the week at Christmases and birthdays back through the years. Finally, for the fact that nobody has repeated this work adequately.⁷ Forty men and 10 women between the ages of 20 and 24 were regressed to 4, 7, and 10 years. The days of the week were easily checked with a 200-year calendar. A test in the waking state revealed that, "An extremely small percentage gave correct answers to any of the questions, leading one to believe that when correct answers were given they were largely owing to chance". This, of course, should have been about 14 percent. The results under hypnotic regression are shown in Table 6. For all ages the average recall was 82.3 percent correct days. True's data were not corrected for chance success, but it is obvious from the table that doing so does not change the outcome of the experiment. There is progressively better recall with age, and young children appear to be more impressed with Christmas than with a birthday. The latter finding is in accord with the report of hypermnesia under hypnosis for emotionally charged material (Rosenthal, 1944).

Five years after True's work, Best and Michaels (1954) obtained largely negative results in a pilot experiment that had some points in common with True's method. They hypnotically regressed five subjects of 21 to 25 years to two past birthdays that fell on either Saturdays or Sundays; i.e., non-schooldays.

Table 6
Percent Correct Recall of 100 Memorable Days under
Hypnotic Age Regression
After True (1949)

Regressed age	4		7		10	
Day recalled	Birthday	Christmas	Birthday	Christmas	Birthday	Christmas
Uncorrected for chance	62	76	84	86	92	94
Corrected for chance ^a	56	72	81	84	91	93

^a $p = \frac{(p' - c)}{1 - c}$, where p' is the obtained percent and c is the probability.

In this case $c = 0.143$.

Four subjects incorrectly claimed to have attended school on both birthdays, and one subject said she went to school on one birthday but not the other. Out of 10 responses, nine were wrong. The subjects were also given a digit memory span test. The authors state, "At the regressed levels all the subjects responded appropriately on the digit span test, failing levels associated with higher age groups". The digit test finding was given as evidence that the subjects were regressed to an extent, and it was concluded that "age regression is not true or complete. Subjects cannot return under hypnosis, at the will of the hypnotist, to any specific time or place in their personal history" (their italics).

Gakkebush et al. (1930) presented their subject a word association test at seven regressed ages between four and 12 years. Reaction times on responses to 10 words shortened with increasing age, and the responses became more appropriate to the stimulus words.

Maierov and Suslova (1951) analyzed the development of speech patterns under hypnotic age regression. Five subjects of varying psychopathology between the ages of 21 and 45 were regressed to ages from one to 10 years. The subjects were tested by being required to pronounce words given by the experimenter. Childish speech patterns shown by elision, sound substitution, and the like, were present from one to five years, and appeared to follow the normal development of child speech. From six onward, the words were repeated in adult form.

In another study Maierov and Suslova (1952) regressed a 47 year old woman with hysterical symptoms. At the suggested ages of one to two years, some childish behavior was observed mixed with

more mature responses. Behavior was less ambiguous at the suggested ages of 5, 14, 16, and 35 years where the most objective test applied was taking dictation. Since the woman learned to write before the Russian orthography was modified in 1918, she used some of the old letters in her spelling when regressed to a time before this date. Age progression to 70 and 75 years yielded more convincing behavior than was found at the regressed ages of one to three.

Suslova (1952a) has reported success in distinguishing between mental performance in the waking state and the somnambulistic phase of hypnosis by measuring the speed and errors made in the simple addition of digits. As compared with the waking condition, the results on six subjects under hypnosis showed a decrement in the number of sums performed in 5 min. samples, and an increase in the number of errors. This test, considered to be an index of the functional capacity of the cerebral cortex, was used by Suslova (1952b) in a second paper on age regression. Ten subjects between the ages of 18 and 44 with mild psychopathology were tested in the waking condition, the hypnotic condition without age suggestions, and at a variety of regressed ages down to seven years. The development of the ability to add facilely was readily apparent in the results. At the early suggested ages the performance was lowest, later it approximated that of adulthood. The data under hypnotic regression were compared with performance under non-regressed hypnosis, since it had already been shown that fewer additions were made in hypnosis than when awake. At some ages a factor of five or more separated the regressed from the normal hypnotic performance. Some interesting sidelights were reported. One, reminiscent

of Erickson's (1937) case, was found by accident. The test performance of a 37 year old woman fell at age 30 to below what it was at age 10. It was discovered that she was 30 years old when knocked unconscious during a bombing at a train station while at the front during World War II.

Discussion and Conclusions

While much attention has been given to the spatial storage properties of the brain, the temporal ordering of memory traces is just as much of a mystery (Fessard, 1954, pp. 220-236; Halstead, 1958, p. 108). In either case, memory phenomena in living organisms have long been thought to depend upon modifications that take place in neural tissues. Nevertheless, despite the abundance of theories, no physiological mechanism has yet been demonstrated that accounts for either short- or long-term memory. Galambos and Morgan (1960, ch. 61) have recently reviewed neurophysiological theories such as have been suggested by nearly every worker who has experimented on the brain. Today, in particular, much attention is being paid to the findings reported by Penfield who discovered in 1931 an area on the temporal cortex of epileptic patients where an electrical stimulus may reproduce a memory sequence recorded at an earlier time (Penfield, 1952, 1954, 1955, 1955a, 1958, 1958a, 1959; Penfield & Roberts, 1959).

The views held by psychologists on learning and memory are also varied (Hilgard, 1956), and foremost among them are the interference theory of forgetting of the behaviorists, and the trace alteration theory of the gestalt school. Both have been considered in detail by Osgood (1953, ch. 13) with the conclusion that neither theory accounts for all the facts of memory, nor has been adequately tested.

A fundamental problem about the neural changes that occur in learning concerns their stability and permanence. At one extreme is the suggestion that the deposits we call memory, once laid down

in the nervous system, are retained indefinitely in unaltered form (Penfield, 1955, 1955a, 1958, 1958a, 1959; Penfield & Roberts, 1959). This regards memory as systems of changes that are filed sequentially in time, and are generally inactive. These memory systems are interconnected, however, and may be energized if one has the proper key. The key discovered by Penfield is the electrical reactivation of the ganglionic record mediated by mechanisms presumably in the temporal cortex and the hippocampus (Penfield & Milner, 1958). In the Bekhterev-Pavlov model the key is the conditioned response.

As against this view it may be contended that all memories are subject, in varying degrees, to progressive alteration, and the decay shown in the curves of forgetting. In this process some of the material is irretrievably lost. A common sense position lies somewhere between. Certain experiences are evidently impressed with sufficient emphasis to be retained for life. Others, like those needed to repeat a sequence of digits in the memory span test, may endure for only seconds. Psychologists often refer to motivation as the force that contributes greatly to the difference between remembered and forgotten events, but only recently have cerebral structures been proposed that may, one day, provide a neural basis for motivation as a mechanism in memory (Samuels, 1959).

Normal Recall

It is a commonplace observation that some very remote events in the past can be recalled with seeming clarity. This is accomplished by a process during which one attempts to search old memory files using his own keys. We are never sure that such

recollections are free from the taint of recent, perhaps even frequent, reenforcement, and seldom can they be objectively verified or dated in a manner to satisfy the skeptic.

Studies on the normal recovery of old memories are scarce. Ebbinghaus (1902, p. 647) reported relearning a large, but unspecified, number of stanzas from Byron's Don Juan after 22 years with a saving of seven percent. Titchener (1923), after 46 years, relearned the 27 eight-line stanzas of a poem by Milton in 14 readings. Unfortunately, he had no recall of how long it took to learn the poem as a 10 year old schoolboy, but it seems reasonable that it was greatly in excess of this. During the first reading he recognized clearly some parts of the poem. Burt's (1932, 1937, 1941) study on early memory stands alone as a controlled experiment. Nonsense material consisting of three 20-line selections of Greek iambic-hexameter were read daily to a 15 month old child. Three new selections of the same material were read during each three month period until age 36 months, for a total of 21 selections. At age 8.5 years one-third of the original selections, and three new selections for control, were learned. Then, at ages 14 and 18 years the second and last thirds of the original material were learned with comparable control material. A comparison between the trials required for correct recitation of the original and control material showed 27 percent saving at age 8.5 years, eight percent saving at 14, and zero percent at age 18. In Burt's words, "Apparently the last four years were sufficient to eradicate completely any trace of the original stimulation during infancy" (1941).

Hypnotic Recall

Evidence for hypnotic recall, like that of normal recall, suffers from the lack of verification based on independent criteria. Rarely does there exist unobjectionable proof of the age of a memory trace. The situation is better for the unconditioned responses, but the reappearance of these under hypnosis may well lie out of the bounds of "recall", as ordinarily understood. Nevertheless, since some of the best evidence for regression is the recovery of reflexes, and since this process is intimately related to memory, it is necessary to examine it.

Conclusions from the Physiological Work. It seems clear that the reappearance of involuntary neural mechanisms that existed at pre-adult age levels, must be taken as evidence of regression type II, in Weizenhofer's terminology. The best indication that any such mechanism exists is found in the alteration of the adult plantar reflex. Here we have three cases observed by Gidro-Frank, five by True and Stephenson, three by McCranie et al., one by Sarbin, and an unspecified number by LeCron. McCranie et al., make it clear that dorsiflexion of the great toe is not recoverable in all regressed subjects, and other considerations indicate that a positive Babinski will occasionally appear in other states such as fatigue and sleep. Nevertheless, the fact that dorsiflexion appears rather abruptly at about five to six months argues strongly for a sudden decoupling of this reflex from the control normally exerted via the mature pyramidal tracts. The one reported observation of the Moro reflex also falls in the category of type II.

The sucking response, on the other hand, could be type II, but is so likely to be contaminated with adult knowledge of infant behavior as to be suspect. It has been observed often enough to be admitted as good evidence, but rather of type I at worst, and type III at best.

Except for one case, there is no satisfactory evidence that the infant pulse rate, which averages about 120 beats per min. can be reconstituted. The results from the EEG, if one excepts the single inconstant case of Schwarz et al., are solidly negative.

It is perhaps not surprising that an infantile postural reflex like the Babinski can be recovered, whereas the infantile pattern of brain rhythm cannot. In the one case, the original pathways still exist, and their function has been altered only by the inhibitory influence of neural mechanisms that have matured at a later date. Where these influences are removed by disease, for example, the old pathways control behavior as before. In the case of the EEG, however, we must conclude that the immature pattern has been replaced, not modified, by the adult pattern. We may not recover, then, what no longer exists.

The amazing thing about the disinhibition of the postural reflex is the fact that it is accomplished via informational channels that depend on words: learned material that is new in comparison with the age of the infant reflex arc. The effective suggestion that an individual is five months old and not six, operates through the use of learned verbal material that did not, and so far as we know could not, exist at the ages of five or six months. How can a cut-off sharp enough to release dorsiflexion

at one suggested age, and not another, be mediated by learning that took place five or more years later? Perplexity over this problem is not new. Both Gorton (1949) and Zeckel (1950) have considered it in passing without coming to any conclusion. Zeckel found scant solace in Platonow's reflexological explanation, "If a conditioned stimulus can call forth an elementary conditioned response, the same stimulus can bring to life a large complex of chain reflexes with which it is associated in some way. A special activity can in this way be ascribed to the word which is a complex conditioned reflex stimulus calling forth multiple complex reactions. Thus the complex of the associated engrams embedded mosaically in the brain cortex, and inhibited by the superposing and newly acquired ones, may be reinstated and reproduced with all the accompanying physical and chemical changes" (Platonow, 1933). This might apply to memory mechanisms dating back to the period when words became conditioned stimuli, and, to be sure, this is the general context in which Platonow's remarks were made. Our problem is: what words could possibly have been conditioned to the postural reflexes at the age of six months? The most detailed accounts of how the first and second signal systems of Pavlov (Pavlov, 1941, pp. 113-114; Ivanov-Smolensky, 1954, pp. 222-223) relate to the weakened cortical states said to be at the basis of hypnotic regression are given in the papers of Gakkebush (1928, 1930) and Dolin (1934). Yet, there is nothing here that solves this problem. Until we have done so, we cannot date verbal learning by ascribing to it the same age of the reflex evoked by it.

Conclusions from the Psychological Work. The psychological work on the recovery of recent memory material is summarized in Table 7. It is clear that meaningful and emotionally stressed material is more readily available under hypnosis than in the waking state. Indifferent material is not. However, in either case recovery is not complete—there is always some loss, just as there is in normal recall processes. It may be objected that testing for memory under the conditions of these experiments is not true age regression in that precise suggestions that recall be made at an earlier age were not given. However, as was said earlier (p. 12), regression may be implied, and there is no logical reason for holding that a form of regression, i.e., the reactivation of specific old responses, is not involved. If admitted as regression, it seems to be plainly regression of type II, and not a matter of role-playing.

Table 8 brings together the results of the various psychological tests that have been used to recover remote memory. It summarizes a motley lot of conclusions from experiments that are mostly inadequate from the standpoint of number of subjects, controls, and the use of objective criteria. First should be considered the sizeable experiments of Young, Sarbin, and Kline using intelligence tests (Young, 1940; Sarbin, 1950a; Kline, 1950). Young and Sarbin both showed that role-playing can produce an acceptable approximation of an M.A. at the suggested C.A. Kline did not show that his subjects could not have role-played adequately in his experiment. Nevertheless, Sarbin found that the depth of hypnosis correlated with the accuracy with which the appropriate M.A. was reached. The most reasonable conclusion is that the

Table 7

Summary of the Results Comparing Hypnotic and Waking Recall of
Material Recently Learned in the Waking State

Investigator	Type of Material	No. of Subjects	Delay between Learning & Recall	% Gain due to Hypnosis
1. Young (1925)	Nonsense syllables	19	0 (?)	~ 0.0
2. Huse (1930)	"	8	24 hrs.	- 3.0
3. White, et al. (1940)	"	8	24 hrs.	- 15.7
4. Rosenthal (1944)	"	13	24 hrs.	- 1.2
5. Mitchell (1932)	Three place numbers	2	5-7 min.	- 30.0 for savings in trials 6.0 for savings in errors
6. Stalnaker & Riddle (1932)	Poetry	12	1 yr. or more	53.7
7. White, et al. (1940)	Poetry	8	24 hrs.	53.1
8. Rosenthal (1944)	Poetry	13	24 hrs.	24.0
9. White, et al. (1940)	Motion picture scenes	8	Av. = 2.5 days	83.1
10. Young (1925)	Adj.-noun assoc.	19	0 (?)	~ 0.0
11. Young (1925)	Logical sequences	14	0 (?)	~ 0.0
12. Young (1926)	Misc. objects	2	?	~ 0.0
13. Sears (1954)	Misc. objects	24	0-1 wk.	10.9 - 25.0
14. Rosenthal (1944)	Words mixed with nonsense syls.	13	15 min.	- 1.0
15. Rosenthal (1944)	Words mixed with nonsense syls. plus tension	13	15 min.	39.0
16. Rosenthal (1944)	Poetry plus tension	13	10 min.	- 0.4
17. Rosenthal (1944)	Emotional mixed with neutral words	13	24 hrs.	0.03
18. Rosenthal (1944)	Verbal & motor tasks plus tension	13	0 (?)	17.9

Table 8

Results of Psychological Tests given during Hypnotic Age Regression

Investigator	No. of Subjects	Test	Results
1. Gakkebush, et al. (1930)	1	Binet-Simon	M.A. appropriate to C.A.
2. Platonov & Prikhodivny (1930); Platonow (1933)	3	Binet-Simon	M.A. too high for C.A.
3. Young (1940)	10	Stanford-Binet	M.A. too high for C.A.
4. Sarbin (1950a)	12	Stanford-Binet	M.A. too high for C.A.
5. Kline (1950)	10	Otis	M.A. appropriate to C.A.
6. Keir (1945)	1	Stanford-Binet	M.A. appropriate to C.A.
7. Leeds (1949)	1	Stanford-Binet Vocab.	Definitions showed maturation of intellect.
8. Kline (1951a)	1	Wechsler-Bellevue	M.A. slightly high for C.A. but within experimental error.
9. Spiegel, et al. (1945)	1	Stanford-Binet	M.A. sometimes too high or too low for C.A.
10. Gakkebush, et al. (1930)	1	Rorschach	Personality development traced by test.
11. Orne (1951)	10	Rorschach	Incomplete regression, personality remained adult.
12. Sarbin & Farberow (1952)	2	Rorschach	Regressed role consistent with adult role.
13. Bergman, et al. (1947)	1	Rorschach	Test followed clinical data.
14. Mercer & Gibson (1950)	1	Rorschach	Normal personality for regressed ages.
15. Norgarb (1952)	1	Rorschach	Personality development traced by test.
16. Keir (1945)	1	Rorschach	Personality unchanged by regression.
17. Kline & Haggerty (1953)	1	TAT	"Neuropsychological validity" of regression upheld.
18. Taylor (1950)	12	Goodenough	Primitive and mature features present together.
19. Orne (1951)	10	Modified Goodenough (?)	Incomplete regression, personality remained adult.
20. Bergman, et al. (1947)	1	Goodenough	Rough indication of primitivity.
21. Mercer & Gibson (1950)	1	Goodenough	M.A. appropriate to C.A.
22. Cramilneck & Michael (1957)	10	Bender	Regressed drawing atypical of children.
23. Kline & Guze (1951)	1	HTP	Regressed drawing more primitive than adult.
24. Gakkebush (1928)	1	Drawing & handwriting	Regressed performance identical to original childhood samples.
25. Dolin (1934)	2	Drawing & modeling	Regressed performance modified by later experiences.
26. Suslova (1952b)	10	Speed of adding	Regressed adding rate typical of children.

results from intelligence tests demonstrate regression type III.

The results on the Rorschach from the two largest studies, two and 10 subjects, are negative. Both Orne (1951) and Sarbin and Farberow (1952) found that adult personality patterns permeated the regressed productions. The other Rorschach studies are interpreted by their authors as verifying age regression in varying measure. Sarbin's position, however, is that a form of role-taking is at the very basis of Rorschach responses made under instructions of hypnotic regression. This argues against accepting even the last part of LeCron's statement, when, in the introduction to Norgarb's study he says, "...Rorschach tests offer an excellent means of judging the actuality of hypnotic age regression, for reaction to such a test is difficult if not impossible to simulate" (LeCron, 1952b). The Rorschach, like intelligence tests, doubtless taps old memories, but as mentioned earlier, the Rorschach is not well-suited for accurately dating their ages. The conclusion again is that performance on the Rorschach is a case of type III regression.

The drawing test of Goodenough has been standardized to the extent that M.A.s from drawing scores correlated fairly well with those of intelligence tests (Goodenough, 1926). When given by Taylor (1950) to the largest sample tested with drawings the results were negative. The next largest sample was tested by Orne (1951) using drawings that contained elements of the Goodenough. The results were negative. The results of the Bender by Crasilneck and Mitchell (1957) on 10 subjects were also negative. In the few positive cases, all on one or two subjects, it is likely that most adults would know enough about the simplicity of children's drawings

to make this kind of test result suspect. In any event, drawing must be put down as type I or III regression.

Suslova's (1952b) adding test was not scaled to age and, therefore, does not date the ages of the memories on which the performance was based. Further, there is no reason to believe that type II regression was demonstrated. The slower adding rates of early childhood could have been simulated.

In the physiological studies the plantar reflex provided a response difficult to explain away. With the psychological studies it is True's (1949) experiment on the recall of dates that appears to present remarkable evidence for the reactivation of old neural connections. If confirmed, this work would qualify as regression type II. Unfortunately, it has not been confirmed, and the contradictory results of Best and Michaels (1954) leave the matter unresolved.

Validity of Hypnotic Age Regression

The genuineness of hypnotically-induced age regression is a much debated theoretical matter. From the viewpoint of the hypnotist, the questions of "exact chronological duplications" (Schneck, 1956), and the precision attained in memory recovery (Smith & Zawadski, 1951) may be quite academic. He has too often seen that hypnotically-aided recall has been useful, especially when the patient has been allowed freedom in regression. Nevertheless, the question of the validity of age regression deserves some kind of answer. Gill points out that it depends on what one means by genuine. Speaking of a clinical case of spontaneous regression he says, "If by genuine regression one means a state such as was

described by revivification⁸, we feel there is no such thing; but if by genuine regression one means a significantly altered ego state, oriented to and integrated in a previous time in the patient's life history, but with the retention of a relationship, conscious or unconscious, to current reality, this case shows that such a state can develop spontaneously on the induction of hypnosis. This spontaneous regression showed many of the features described in accounts of induced hypnotic regression. It is true that some instances of induced regression are more 'complete' than the one here described and that in them inconsistencies as glaring as answering questions about matters subsequent in time to the regression do not occur. The reasons probably lie in the careful instructions with which such states are induced." (Gill, 1948). However, others have shown that even in carefully controlled regressions, leakage from later memory systems occurs (Orne, 1951; Sarbin, 1950a; Taylor, 1950; Crasilneck & Michael, 1957). There can be no doubt that some old memories are revealed by hypnotic age regression just as some are recovered during well-motivated efforts to recall in the waking state. The fundamental question is: Which state is superior? Nearly twenty years ago White wrote that a theory of hypnosis must explain, among other things, the fact "...that the hypnotized person can transcend the normal limits of volitional control..." (White, 1941). Offered in partial support of this was evidence for the improvement of recent memory in the trance state. This evidence is still in good standing although it has been shown that it is largely meaningful and emotionally stressed material that is retained. Orne (1959) has recently found reason to be skeptical of the claim that normal physiological capacities are transcended

in the hypnotic state. The present review affords little evidence for type II regression. On the physiological side, there is, indeed, the remarkable case of the unconditioned plantar reflex, but the psychological evidence for transcendence in the exact reinstatement of old neural deposits due to learning is hardly convincing. While Kline (Kline, 1951b, 1953c; Kline & Haggerty, 1953) believes that the "neuropsychological" validity of age regression has occasionally been demonstrated, there is nothing in the data to uphold the view that specific memory patterns may be unfolded with precision by hypnotic means. This is to say that there is nothing to show that memory systems are filed temporally in layers, impervious to the ravages of time. This is precisely the conclusion Young (1941) reached two decades ago.

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Footnotes

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²For a discussion of scaling hypnotic depth see Weitzenhofer (1953), and Solovey de Milechnin (1955) has an interesting account of what depth may mean in hypnosis.

³Bibliographic use of this reference by students contributing to the literature of hypnosis must be viewed with amazement. For nearly 30 years it has been cited by numerous writers always as: Hakebush, ____, Blinkowski, ____, and Foundillere, R. The reference is apparently due to an abstract submitted by Willoughby (1933). However, the staff of the Psychological Abstracts was able to locate in its old files only an abstract in French from an unidentified source. This suggested the Année Psychologique. Sure enough, an abstract by Mazé (1931) was there with a slightly different spelling of the names, but still with the initials missing. Willoughby's abstract was an abbreviated translation of this.

An attempt to locate anywhere in this country a library with holdings of Trudy Instituta Psikhonevrologii, Kief, was unsuccessful. A copy of this journal was finally obtained through courtesy of Mme. S. A. Zerchaninova, V. I. Lenin State Library of the USSR in Moscow. The missing initials of Gakkebush, et al. (1930) were conspicuously present, and Blinkowski turned out to be Polinkovskii! Since the pages of the Moscow copy were uncut, one may conclude that fewer have seen this work than have quoted it. Inasmuch as it has been used so frequently to support the position of bona fide age regression, the findings of Gakkebush, et al., will be treated at some length in various sections of this review. The complete protocols in the original are very interesting.

⁴For a review and estimate of the problem of the efficiency of initial learning in the hypnotized condition, see Uhr (1958).

⁵Improvement of memory for any reason is called hypermnasia.

⁶I am indebted to Dr. Nancy Bayley, National Institutes of Health, for examining the published records. She reports the uneven mental development shown in these tests to be characteristic of many children.

⁷Dittborn (1951) applied True's test to only one subject and got two correct responses out of six.

⁸I take this to mean regression type II.

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